Standardizing Coherent Signaling and IEEE P802.3df

IEEE P802.3df Task Force
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Introduction

- Two IEEE P802.3df physical layer objectives that are likely candidates for coherent approaches:
  - Define a physical layer specification that supports 800 Gb/s operation:
    - over a single SMF in each direction with lengths up to at least 10 km
    - over a single SMF in each direction with lengths up to at least 40 km
- Current status of IEEE P802.3cw should be considered by IEEE P802.3df Task Force
- Note – John D'Ambrosia is Chair, IEEE P802.3cw Task Force

Historical Perspective

- IEEE P802.3cw previously part of
  - IEEE P802.3cn – Beyond 10km (first TF meeting Nov 2018)
    - 50 / 200 / 400 Gb/s Ethernet over 40km SMF
    - 100 Gb/s Ethernet over DWDM Systems
    - 400 Gb/s Ethernet over DWDM Systems
  - IEEE P802.3ct – 100 Gb/s and 400 Gb/s over DWDM systems (first TF meeting Mar 2019)
    - 100 Gb/s Ethernet over DWDM Systems
    - 400 Gb/s Ethernet over DWDM Systems

- IEEE P802.3cw (first TF meeting Apr 2020) has been in Task Force Review since 29 Mar 2021
- Currently in 5th Task Force Review
  - Remaining TBD's may be found https://www.ieee802.org/3/cw/D1p4_TBD%20Summary.pdf
- P802.3cw will miss WG ballot schedule per project timeline (adopted 27 Sept 2021)

Key Item – Transmitter Quality Metric (TQM)

- **IEEE P802.3ct**
  - **Uses DP-DQPSK signaling**
  - **EVM was leveraged within P802.3ct as TQM**
    - **Developed and validated within ITU-T**
- **IEEE P802.3cw**
  - **Uses DP-16QAM signaling**
  - **EVM was adopted as part of TQM in Jul 19**
    - **It is unclear what impairments track with and are covered by EVM**
  - **Proposed testing is challenging - but similar to what was done for 100G Coherent**
  - **Summary of data presented –**
    - **Initial measurement results on EVMRMS for DP-16QAM presented in https://www.ieee802.org/3/ct/public/19_03/anslow_3ct_02_0319.pdf**
    - **Initial measurement results on EVMRMS for DP-16QAM presented in https://www.ieee802.org/3/ct/public/19_07/pittala_3ct_01a_0719.pdf**
    - **400GBASE-ZR EVM Pass/Fail Criteria –https://www.ieee802.org/3/ct/public/19_11/way_3ct_01b_1119.pdf**
  - **Call to Action June 2021 for test data - https://www.ieee802.org/3/cw/public/tf_interim/21_0614/nicholl_3cw_01a_210614.pdf**
  - **EVM / Interop data has been submitted – but update to that presentation is expected on 2/23/22.**
  - **No alternative complete proposals have been made**

Observations from Other Organizations

- OIF
  - 400ZR IA Transmitter specifications based on limits for individual transmit parameters, rather than a single TQM
  - 400ZR – EVM specifications – future work item

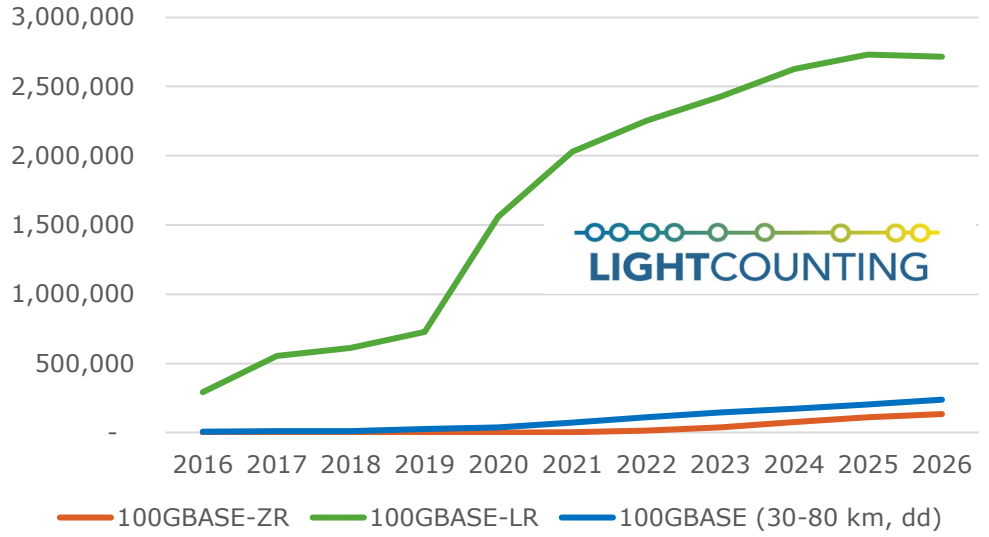
- ITU-T SG15 Q6
  - Liaison to IEEE 802.3 (17 Dec 2021)
    - https://www.ieee802.org/3/minutes/jan22/incoming/SG15-LS343_Redacted.pdf
    - "… a decision was made to remove the work item "G.698.2 addition of 200G and 400G" from our work programme due to a very limited outlook that sufficient measurement data would be contributed within the foreseeable future from multiple implementers towards establishing a suitable quality metric (e.g., EVM) for a 400 Gbit/s DP-16QAM transmitter. "

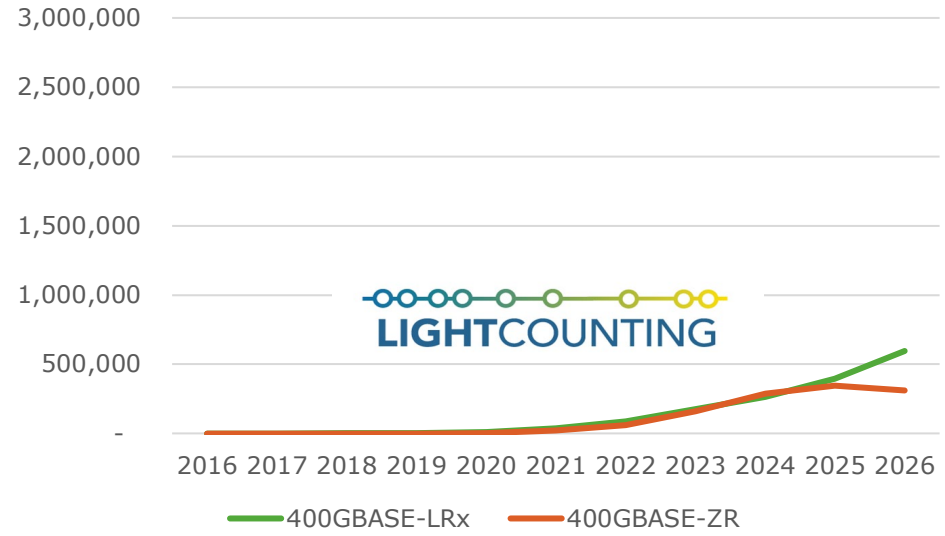
100GbE / 400GbE Optics Targeting ≥ LR

Data provided by Vlad Koslov, LightCounting (Jan 2022)

Observations

- From 2016 to 2026, 100G optics targeting 10 / 20km >> 100G coherent or direct detect optics targeting 30 – 80 km
- 400G optics are in initial ramp-up phase
  - Similar volumes between 10km and 120km over next 4 years
  - 120km optics forecasted to fall off in 5 years
- 10km optics historically higher volume
- Coherent optics targeting 10km space will need to meet a higher burden than previously for multi-vendor interoperability





Going Forward

- **OIF 800LR**
  - **Approach to TQM unclear – as EVM specifications are TBD for 400ZR**
- **IEEE P802.3cw**
  - **802.3 WG has been informed of slow progress and lack of contributions**
- **IEEE P802.3df needs to consider the state of standardizing coherent signaling**
  - **LR anticipated to reach higher volumes than ZR –**
  - **Multi-vendor interop ("plug-n-play") is expected in traditional Ethernet applications**
  - **IEEE P802.3cw has made little progress to expand the 802.3 Toolbox relevant to IEEE P802.3df objectives**

THANK YOU!